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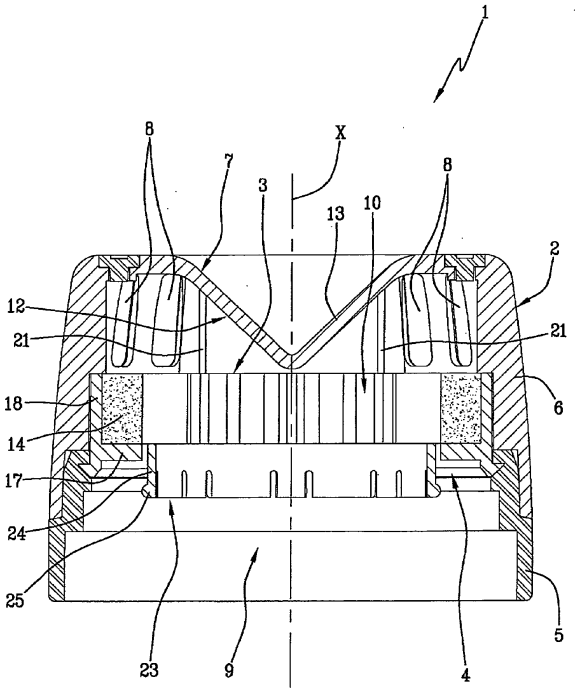
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(54) A silencer device for a hair dryer

(57) A silencer device for a hair dryer comprises a container structure (2) exhibiting a plurality of inlet openings (8), an outlet opening (9) and a conduit (10) connecting the inlet (8) and outlet (9) openings to one another and further comprising a ring (14) made of sound-absorbent material, inserted in the conduit (10) such as to interfere with a flow of air between the inlet openings (8) and the outlet (9) opening in such a way as to at least partly attenuate sound vibrations associated to the air flow. The inlet openings (8) are made on a lateral wall (6) of the container structure (2) and face the axis (X) such as to define an air flow along a first transversal direction to the axis (X) such as to define a flow of air along a first transversal direction to the axis (X), and deviating means (12) arranged in the conduit (10) impress an axial deviation along the axis (X) on the air flow coming from the inlet openings (8).

Fig.5B



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Description

Description.

[0001] The present invention relates to a silencer device for a hair dryer.

[0002] Silencer devices for hair dryers are currently known which are applicable to the aspirating grid of a hair dryer such as to realise a particular treatment of the air flow entering with the aim of reducing the noise emitted during the functioning of the hair dryer.

[0003] These known silencer devices exhibit an inlet section and an outlet section, both axially aligned with respect to the aspiration direction of the hair dryer fan, and further exhibit annular zones lined with a sound-absorbent material, interposed between the inlet and outlet sections.

[0004] The air flow, entrained by the fan of the hair-dryer and forced to pass through the above-mentioned lined zones, is filtered of the sound frequencies by the lined zones, with a reduction of the overall sound emitted.

[0005] The lined zones are realised with toroidal bodies having a generally rectangular section.

[0006] The Applicant has however established that the silencer devices of known type are further improvable, especially due to the fact that they absorb an excessive quantity of power, caused by load losses in connection with the passage of air across the silencer devices.

[0007] Further, the sound-reduction effect is susceptible to further improvement. It is worthy of consideration that the silencer devices are generally applied to hair-dryers of a professional type, which are used by specialised personnel who make considerable use of them for many hours during the course of a day. It is therefore clear that the noise produced by the hair-dryer constitutes a source of disturbance, if not indeed a relevant problem in the work activity of the workers, and thus an improvement of the sound-reducing capacity of the silencer device might notably improve the working conditions, especially over a long period.

[0008] In this context, the technical aim at the base of the present invention is to provide a silencer device for hair-dryers which obviates the drawbacks of the above-cited prior art.

[0009] In particular, an aim of the present invention is to make available a silencer device for hair dryers which realises a high level of sound absorbance connected to noise and, therefore, a high level of sound-attenuating of the hair dryer.

[0010] A further aim of the present invention is to provide a silencer device for hair dryers which exhibits a low absorbance of power related to the sound-proofing produced.

[0011] The set technical task and the set aims are substantially attained by a silencer device for hair dryers comprising the technical characteristics set out in one or more of the accompanying claims.

[0012] Further characteristics and advantages of the present invention will more clearly emerge from the indicative description, provided by way of non limiting example, of a preferred though not exclusive embodiment of a silencer device for hair-dryers, as illustrated in the accompanying figures of the drawings, in which:

- figure 1 is a perspective view of a silencer device according to the present invention;
- figure 2 is an exploded perspective view of the device of figure 1;
- figure 3 is a lateral view of the device of figure 1;
- figure 4 is a plan view of the device of figure 1;
- figure 5A is a section view of the device of figure 4 according to directrix line V-V and with some parts removed better to evidence others;
- figure 5B is a section view of the device of figure 4 according to directrix line V-V and in a complete configuration;
- figure 6 is a section view of the device of figure 4 according to directrix line VI-VI;
- figure 7 is a section view of the device of figure 4 according to directrix line VII-VII;
- figure 8 is a section view of the device of figure 4 according to directrix line VIII-VIII;
- figure 9 is a section view of the device of figure 1 coupled with a hair-dryer;
- figures 10A-10C are lateral views of a silencer device according to the present invention and in accordance with further different embodiments;
- figures 11A-11C are section views, respectively, of the devices of figures 10A-10C, according to directrice lines as in figures 5A, 5B;
- figures 12 and 14 are two further embodiments of the ring 14 made of sound-proofing material;
- figures 13 and 15 show two sections along diameter planes respectively of figures 12 and 14;
- figure 16 illustrates a further embodiment of the ring 14 which is made by stacking of three slim rings exhibiting different internal profiling;
- figure 17 illustrates a section according to a common diameter plane of the three slim rings of figure 16.

[0013] In accordance with the accompanying figures, 1 denotes in its entirety a silencer device according to the present invention.

[0014] As can be seen in figure 1, the silencer device 1 has a substantially cylindrical, or slightly tapered, external form, defining a sort of trunco-conical shape, closed at a first end 1a (visible in figure 1) and open at the other end 1b (hidden in figure 1 as it is the lower end).

[0015] In the view of figure 2, the silencer device 1 comprises a container structure 2, in which attenuating means 3 are inserted, and a support element 4 provided such as to block the attenuating means 3 in a stable position internally of the container structure 2.

[0016] The silencer device 1 further comprises an external body 5 which at least partially envelops the container structure 2. The external body 5 is preferably made

of a rubbery material and has the function of realizing a sealed connection of the silencer device 1 to a hair dryer (figure 9).

[0017] In more detail, the container structure 2, as visible in figure 2, exhibits a lateral wall 6 having the above-mentioned tapered shape, and a bottom wall 7 connected to the lateral wall 6 to close the mentioned first end 1a of the device 1.

[0018] The whole container structure 2, and in particular the lateral wall 6, develops substantially axial-symmetrically about an axis "X" which, once the silencer device 2 is applied to the hair-dryer 100, is parallel or coincides with the direction of the air flow in aspiration by the fan 101 of the hair dryer 100.

[0019] The bottom wall 7 is therefore arranged transversally, preferably perpendicular, to the axis "X".

[0020] The container structure 2 exhibits at least an inlet opening 8, an outlet opening 9 and a conduit 10 connecting the inlet opening 8 and the outlet opening 9. In the embodiment illustrated in figure 1, the container structure 2 exhibits a plurality of inlet openings 8 distributed about the axis "X". The openings 8 are arranged in two diametrically-opposite groups together defining two recesses 11 that are diametrically opposite and destined to be coupled, by interference or joint, with the rubbery external body 5.

[0021] The inlet openings 8 advantageously face the axis "X" such as to define an air flow along a first transversal direction, and preferably a substantially perpendicular direction to the axis "X" itself.

[0022] In other words, the inlet openings have a transversal lie, or a substantially perpendicular lie, to the above-mentioned first direction, i.e. they are destined to enable a passage of an air flow which, when perpendicularly crossing the inlet openings 8 themselves, is directed towards the axis "X".

[0023] In more detail, the mentioned inlet openings 8 are made on the lateral wall 6 of the container structure 2, preferably in a position that is adjacent to the bottom wall 7.

[0024] In accordance with the embodiment illustrated in figures 1 and 2, the inlet openings 8 are elongate in the direction of the axis "X" and are preferably rectangular or substantially rectangular. Thus they are adjacent to one another along a larger side thereof.

[0025] The outlet opening 9, on the other hand, has a perpendicular lie to the axis such as to realise, in outlet from the silencer device 1, an axial air flow along the axis "X".

[0026] The inlet openings 8 are arranged in proximity of or at the first end 1a of the silencer device 1, while the outlet opening 9 is arranged at the other end 1b of the silencer device 1.

[0027] Further, the silencer device 1 advantageously comprises deviating means 12, active internally of the conduit 10 such as to impress, on the air flow coming from the inlet openings 8, a deviation along a second less angled direction with respect to the axis "X" of the first direction, i.e. defining an angle with the axis "X" which is smaller than the angle defined between the first direction and the axis "X".

[0028] The mentioned deviating means 12 comprise a deviator wall 13 that is transversal to the above-mentioned first direction and which at least partly defines the bottom wall 7.

[0029] In accordance with the embodiment illustrated in figures 5-7 and 9, the deviator wall 13 has a conical shape with a convexity facing towards the conduit 10 and is preferably axial-symmetric with respect to the axis "X". Further, the inlet openings are advantageously directly facing the deviator wall 13. In this way, the air flow coming from the inlet openings 8 is channelled by the deviator wall 13 along the axis "X" towards the outlet opening 9.

[0030] As already mentioned, the sound-attenuating means 3 are housed internally of the container structure (and in particular internally of the conduit 10).

[0031] In accordance with the present invention, the attenuating means are inserted internally of the conduit 10 in such a position as to interfere with an air flow flowing from the inlet openings 8 towards the outlet opening 9 in such a way as to at least partly attenuate the sound vibrations of the air flow.

[0032] The lateral openings located on the circumference of the silencer, together with the central cone and the chamber 21, force the entering air entrained by the fan to follow a compulsory pathway before being sucked in by the fan itself towards the central body of the hair dryer, without causing swirling or obstacles between the entering air and the draught air produced by the fan. The whole volume of air created is directed in its compulsory pathway towards the sound-absorbent material which attenuates the impact and significantly dampens the noise thanks also to the special configuration thereof with radial points directed towards the centre of the conduit, which offer a greater contact surface to the air passage.

[0033] The attenuating means 3 preferably comprise a ring 14 made of a sound-absorbent material exhibiting a central hole 15 which exhibits a plurality of radial protrusions 16 that are reciprocally angularly equidistanced.

[0034] The ring 14 is arranged such as to be centred on the axis "X", i.e. in such a way that the ring 14 is substantially axial-symmetric with respect to the axis "X".

[0035] The ring 14 is held in position, internally of the conduit 10, by means of the above-mentioned support element 4.

[0036] Figures 12-17 illustrate various embodiments of the ring 14.

[0037] The support element 4 is substantially annular, exhibiting an annular base 17 from which a peripheral border 18 perpendicularly departs, defining, in cooperation with the annular base 17, a seating 19 having an annular shape for housing the sound-absorbent ring 14.

[0038] The annular base 17 exhibits a central hole 20 for passage of the axial flow of air close to reaching the outlet opening 9.

[0039] In a mounted configuration of the support ele-

ment 4, the seating 19 is thus arranged between the deviating means 12 and the outlet opening 9.

[0040] The annular base 17 and the border 18 preferably develop circumferentially, i.e. extending along a whole angular development about the axis "X".

[0041] Advantageously, in a mounted configuration of the support element 4, a chamber 21 is preferably afforded between the border 18 and the lateral wall 6 of the container structure 2, which chamber 21 has an annular shape and is in fluid communication with the conduit 10, the function of which is to control any swirling that might develop in the conduit 10, contributing to preventing the forming of swirlings, and to de-couple the border 18 from the lateral wall 6 and, therefore, reduce the vibrations transmitted there-between.

[0042] Special blocking means 22 can be provided on the container structure 2 to stably retain the ring 14 internally of the annular seating 19. In the assembled configuration of the silencer device 1, the blocking means 22 abuttingly receive corresponding portions of the ring 14, thus preventing movement thereof with respect to the seating 19.

[0043] In the embodiment of figures 5A and 5B, the blocking means 22 comprise one or more axial broadenings extending from the bottom wall 7 (for example from the deviator wall 13) along the axis "X" and being of such a length as to reach the position assumed by the ring 14 in the assembled configuration (figure 5B).

[0044] The support element 4 is stably couplable to the container structure 2 by means of snap-joints, for example tabs 28.

[0045] At the position of the central hole 20, the support element 4 can exhibit a coupling flange 23 for realising a stable coupling with a hair dryer 100. The flange 23 can comprise, for example, a cylindrical portion 24 extending distancingly from the annular base 17 in an opposite direction with respect to the border 18, and one or more radial projections 25 extending distancingly from the cylindrical portion 24 such as to realise a connection with a corresponding attaching border 102 of the hair dryer 100.

[0046] As previously described, the presence of the rubbery external body 5 enables adequate fluid seal between the hair dryer 100 (and in particular the rear aspirating section thereof) and the silencer device 1, such that the depression generated by the fan 101 of the hair dryer 100 can be transmitted up to inside the conduit 10 of the silencer device 1.

[0047] The sealed coupling can be guaranteed by a deformable attachment edge 27 realised at an end of the rubbery external body 4, destined to couple with the hair dryer 100.

[0048] With reference to the reduction effect on the emitted noise, the Applicant has found that where the axial dimension (i.e. along the axis "X") of the inlet openings 8 is substantially equal to the axial dimension of the deviator wall 13, the noise reduction effect is optimal.

[0049] In accordance with figures 10A-10C illustrate lateral views of different embodiments of the silencer device 1. In figure 10A, the inlet openings 8 are circular and arranged on two distanced parallel lines along the axis "X".

[0050] In accordance with figure 10B, the inlet openings 8 have an elongate shape perpendicular to the axis "X", i.e. along an angular development about the axis "X". The inlet openings 8 are preferably two pairs, the two pairs being arranged in a diametrically opposite position with respect to the axis "X" and the two openings 8 of each pair being spaced along the axis "X".

[0051] In accordance with figure 10C, the inlet openings 8 are circular and arranged on a single line about the axis "X".

[0052] Figures 11A-11C show section views of different embodiments of the silencer device 1.

[0053] In accordance with figure 11A, the deviating means 12 are defined by a cylindrical wall which, in section along a plane passing through the axis "X" (as in figure 11A), has a substantially rectangular section, possibly with bevelled or connected edges.

[0054] In accordance with figure 11B, the deviating means 12 are defined by a concave wall that is substantially axial-symmetric about the axis "X", the concavity of the wall facing the inlet openings 8.

[0055] In accordance with figure 11C, the deviating means 12 are defined by a pair of deflectors 26, extending from the lateral wall 6 of the container structure 2 towards the axis "X" and inclined towards the attenuating means 3 such as to realise the mentioned deviating action of the flow entering through the inlet openings 8.

[0056] This latter configuration of the deviating means 12 is suitable for inlet openings 8 arranged in configurations of the type illustrated in figure 10A and 10B, i.e. with two lines of openings 8 distanced along the axis "X".

[0057] The present invention attains the set aims.

[0058] The special configuration of the silencer device, with the inlet openings arranged on the lateral openings and the deviating means for deviating the air coming from the lateral openings towards the axial direction and, therefore, towards the attenuating means, has been shown to be effective in reducing the noise emitted by the hair dryer. This occurs because the means set up with the introduction of the silencer: air inlet openings and their position, central cone, chamber 21, sound-absorbent body, all prevent formation of the air swirling phenomena which can be produced on activation of the fan - between entrained air from outside towards the inside, through the filter, and air generated by the movement of the fan - and absorb the majority of the noise produced by the passage of air.

[0059] Further, the special geometry of the sound-absorbent ring, exhibiting the above-mentioned radial protrusions facing towards the axis, contribute significantly to the reduction of the sound emitted. Sound-absorbent material with a special shape/configuration - ring with internal surface, radial points - has been selected because this type of projection offers a very large sound-reducing

surface to the passage of the air and, thanks also to the ring shape, offers no obstruction to air passage. The position of the sound-absorbent ring, together with the air deviator/channelling cone, is designed such that the air immediately encounters the sound-absorbent material which reduces the noise and channels it towards the inside of the hair dryer.

[0060] The result is a greater reduction in noise with respect to devices of the prior art, which exploit an axial aspiration through openings realised on the bottom wall. This improvement, among other things, is obtained without a corresponding increase in power absorbed and, indeed, the special structure of the silencer device of the invention leads to less power wastage with respect to traditional systems.

[0061] This produces a benefit in terms of acoustic comfort in use, as well as an applicability to hair dryers of professional type where the absorbance of power on the part of the silencer device does not have a negative effect on the performance of the hair dryer.

Claims

1. A silencer device for a hair dryer, comprising:

a container structure (2) developing about an axis (X) and exhibiting at least an inlet opening (8), and an outlet opening (9) and a conduit (10) connecting the inlet (8) and outlet (9) openings to one another;
attenuating means (3), inserted internally of the conduit (10) for interfering with a flow of air between the inlet opening (8) and the outlet (9) opening in such a way as to at least partly attenuate sound vibrations associated to the air flow;
characterised in that the at least an inlet opening (8) faces the axis (X) in order to define an air flow along a transversal direction, and preferably substantially perpendicular, to the axis (X), and **in that** the silencer device (1) further comprises deviating means (12),
acting internally of the conduit (10) such as to impress on the air flow coming from the inlet opening (8) an axial deviation along the axis (X).

2. The device of claim 1, wherein the container structure (2) comprises a lateral wall (6), developing about the axis (X), and a bottom wall (7) arranged transversally of the axis (X) and connected to the lateral wall (6), and wherein the at least an inlet opening (8) is realised on the lateral wall (6), preferably in an adjacent position to the bottom wall (7).

3. The device of claim 1 or 2, wherein the deviating means (12) at least partially define the bottom wall (7).

4. The device of any one of the preceding claims, wherein the deviating means (12) comprise a deviator wall (13) which is transversal to the first air flow direction coming from the inlet opening (8), the at least an inlet opening (8) directly facing the deviator wall (13).

5. The device of claim 4, wherein the deviator wall (13) extends about the axis (X), preferably over a whole angular development thereof, and wherein the containing structure (2) exhibits a plurality of inlet openings (8) distributed about the axis (X) and directly facing the deviator wall (13).

6. The device of claim 5, wherein the deviator wall (13) has a conical shape having a convexity facing towards the conduit (10) and is preferably axial symmetric about the axis (X).

7. The device of any one of the preceding claims, wherein the outlet opening (9) has a transversal and preferably perpendicular lie in relation to the axis (X), in order to realise a flow of axial air along the axis (X) in outlet from the silencer device (1).

8. The device of any one of the preceding claims, further comprising a support element (4) which is stably couplable to the container structure (2) at the outlet opening (9) and which exhibits a seating (19) for containing the attenuating means (3).

9. The device of any one of the preceding claims, wherein the attenuating means (3) comprise a ring (14) made of a sound-absorbent material which exhibits a central hole (15) a profile of which ring (14) exhibits a plurality of radial protrusions (16) which are angularly arranged to one another.

10. The device of claim 9, when it depends on claim 2, wherein a chamber (22) is afforded between the ring (14) made of a sound-absorbent material and the lateral wall (6) of the container structure (2), which chamber (22) is placed in fluid communication with the conduit (10) for controlling possible air swirls and/or possible vibrations transmitted from the ring (14) to the lateral surface (6).

11. The device of claim 8 or 9, further comprising an external body (5), preferably rubbery, having an attaching edge (27) which is deformable such as to enable a sealed coupling with a hair-dryer (100), the container structure (2) being stably connectable to the external rubbery body (4), preferably by means of reciprocal insertion.

Fig.1

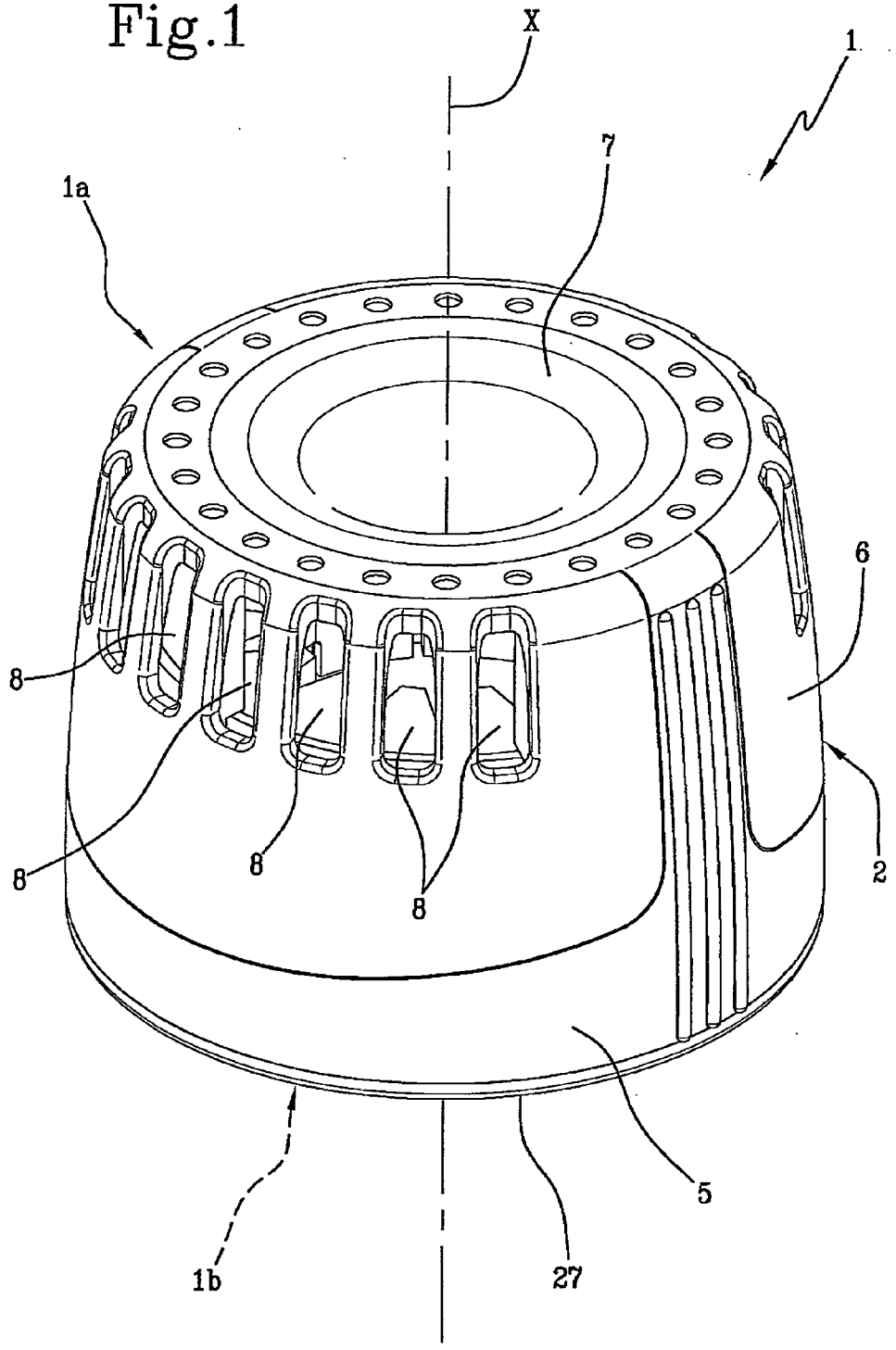


Fig.2

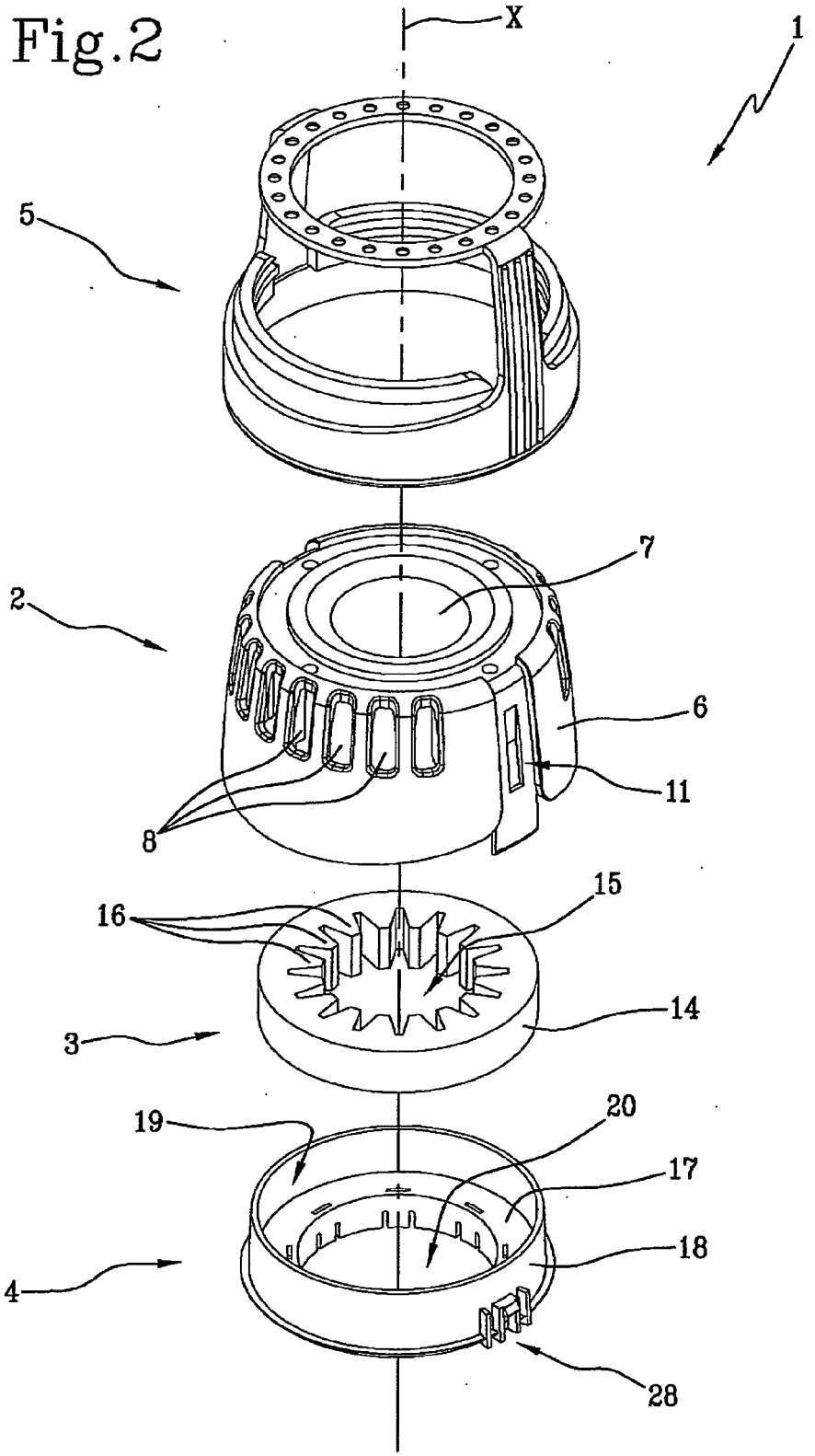
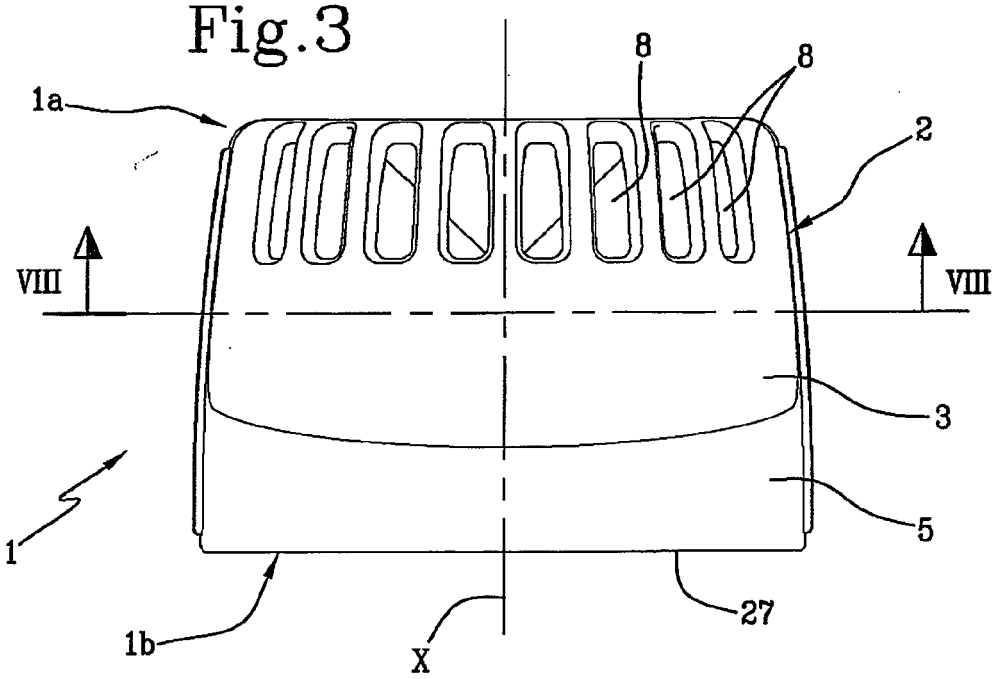


Fig.3



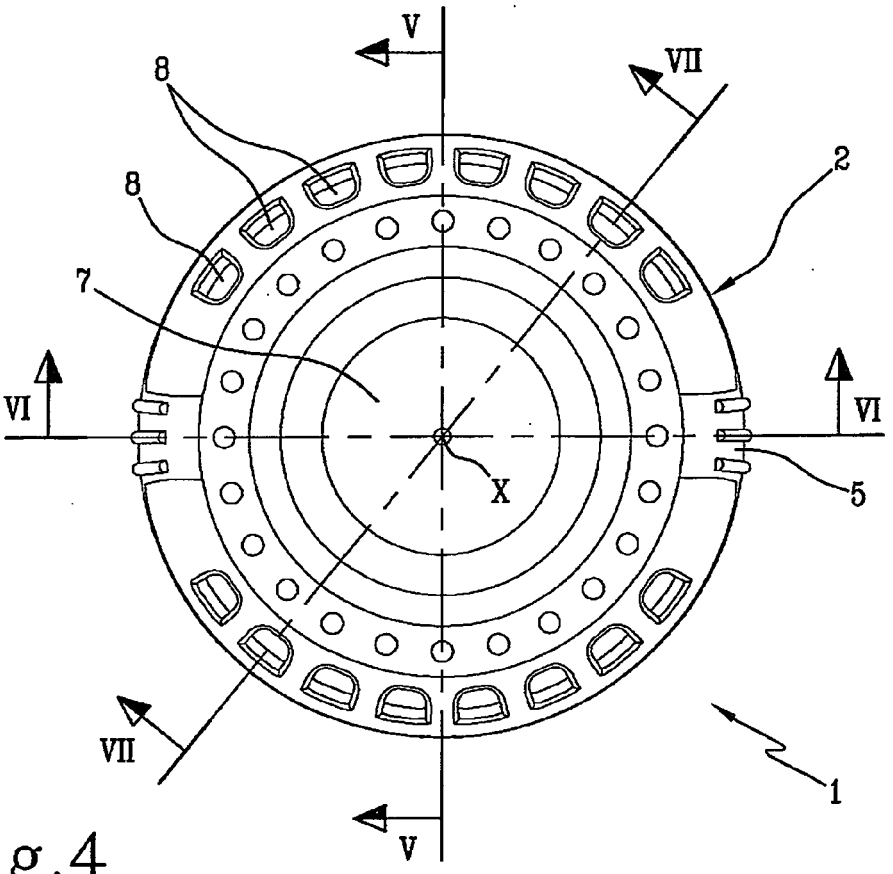


Fig.4

Fig.5A

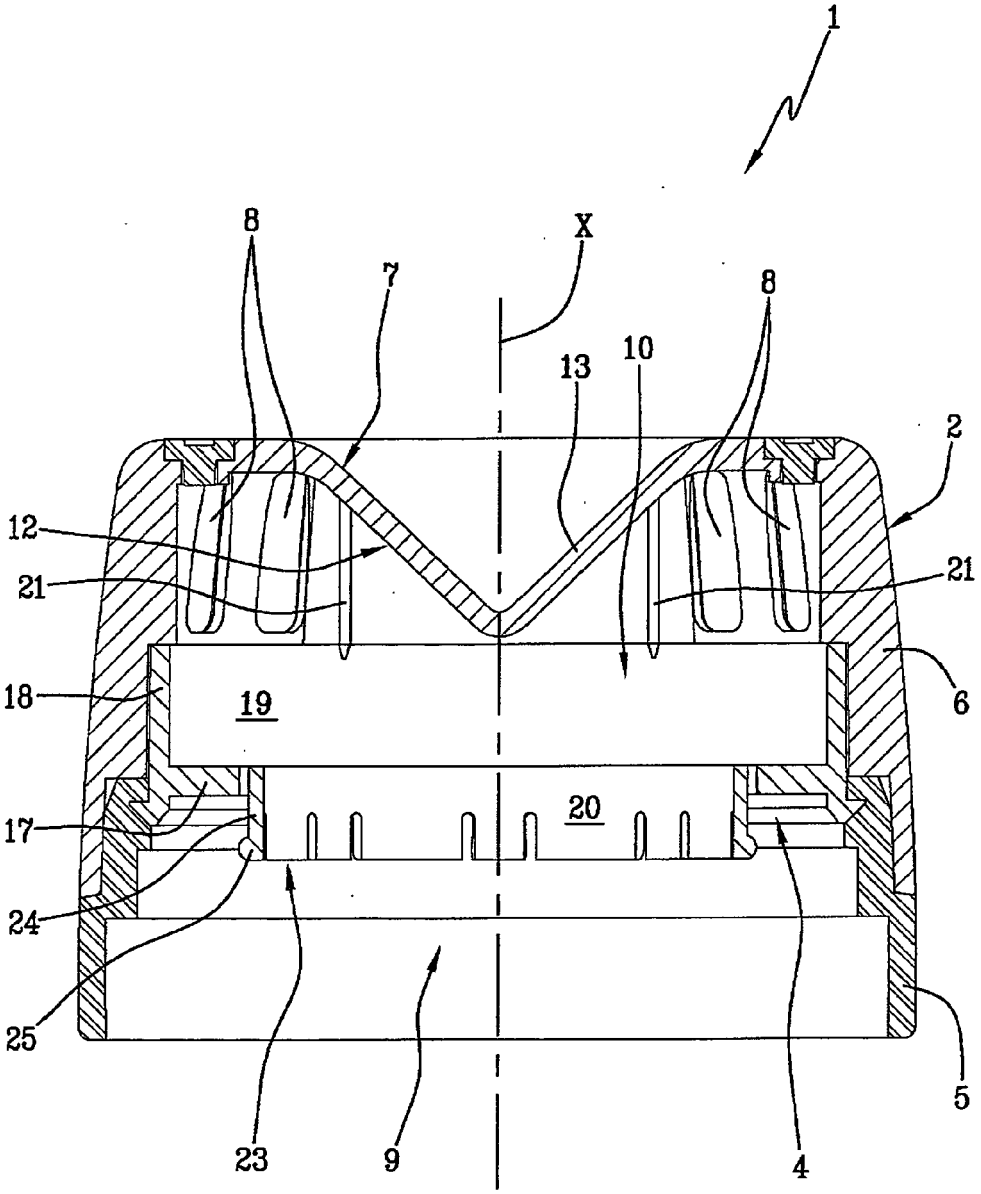


Fig.5B

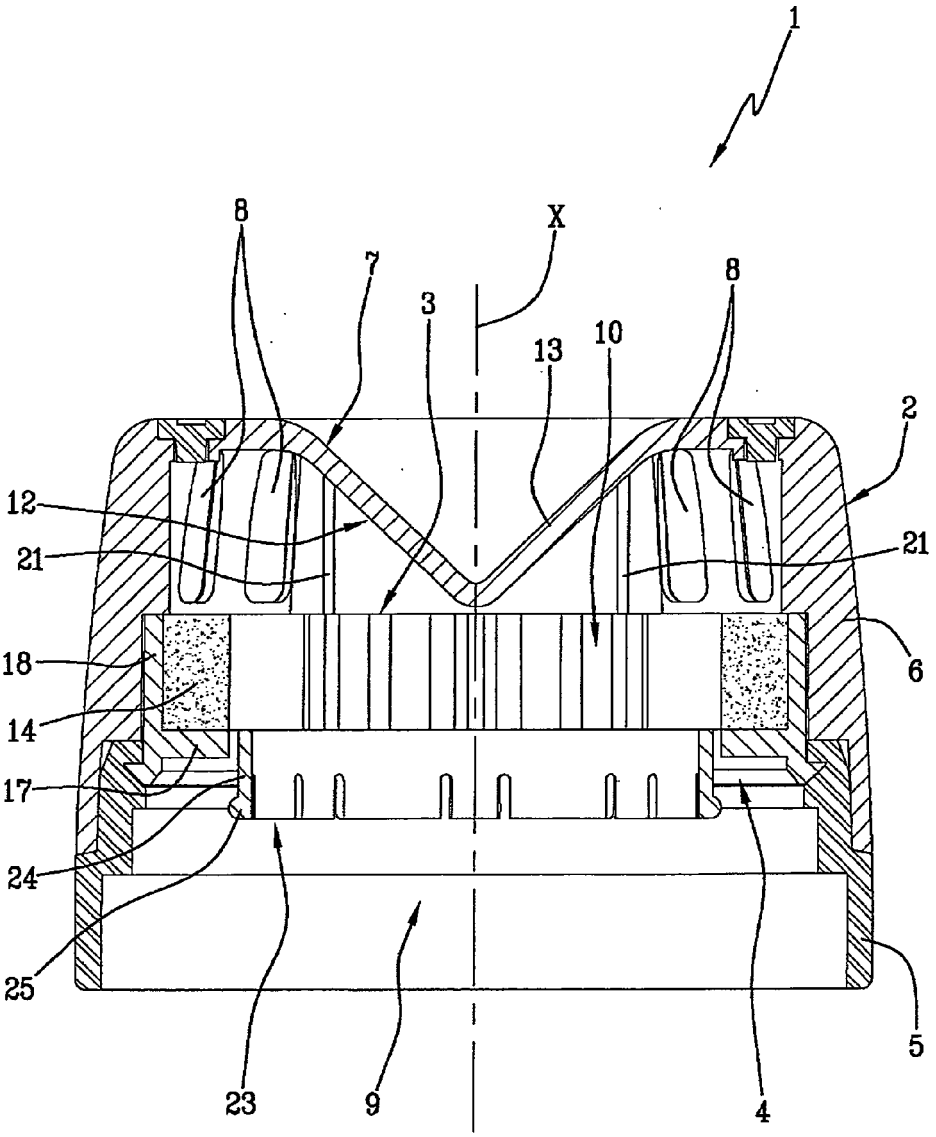


Fig.6

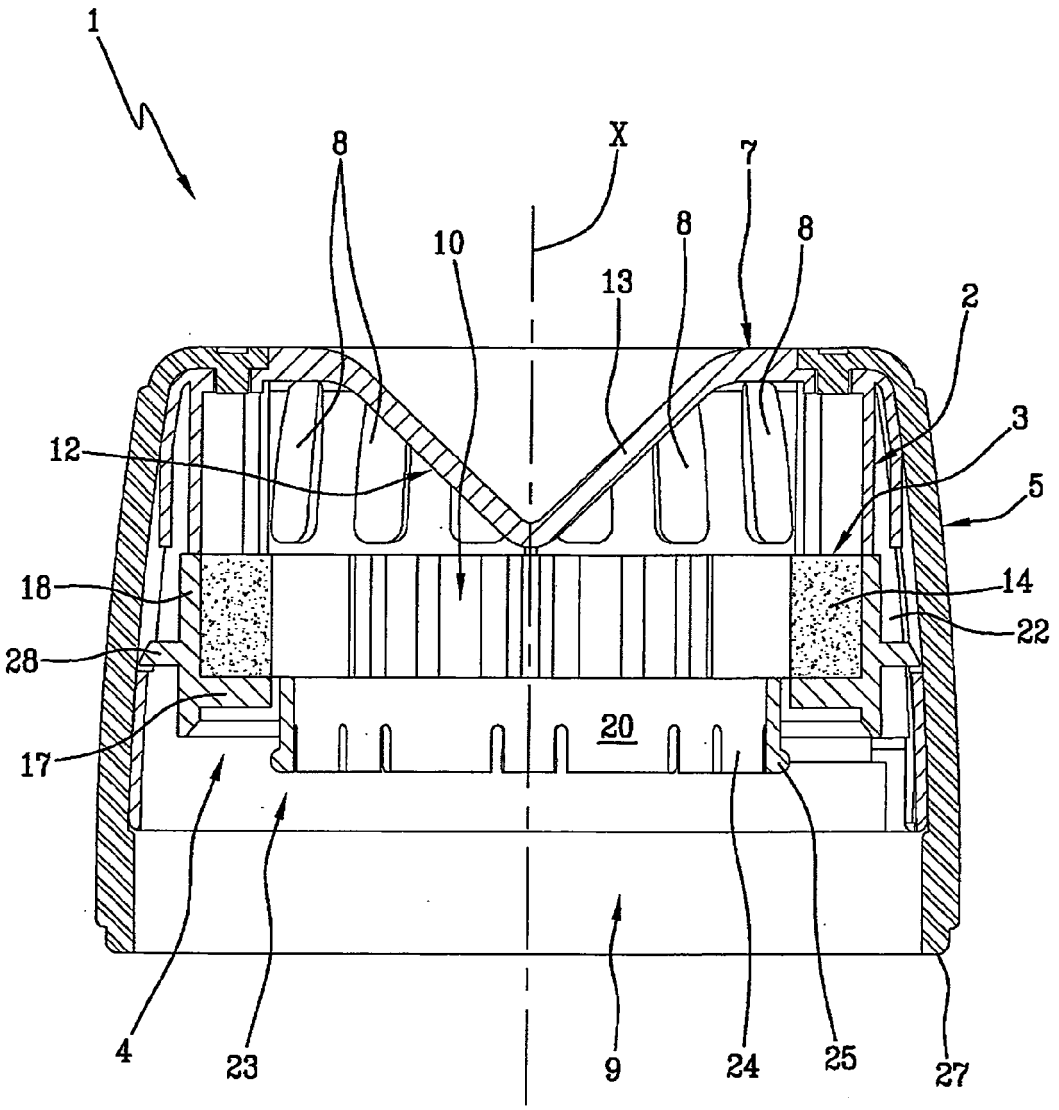


Fig.7

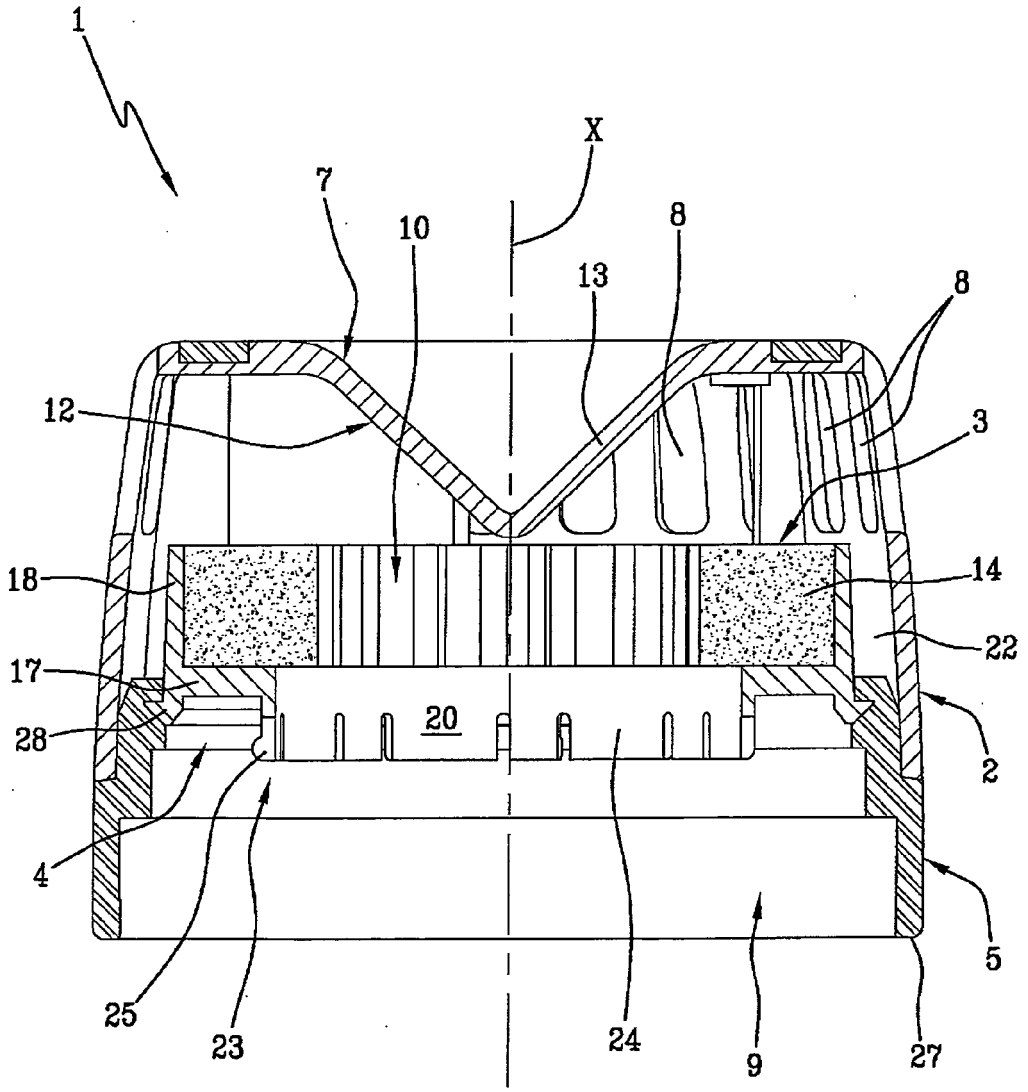
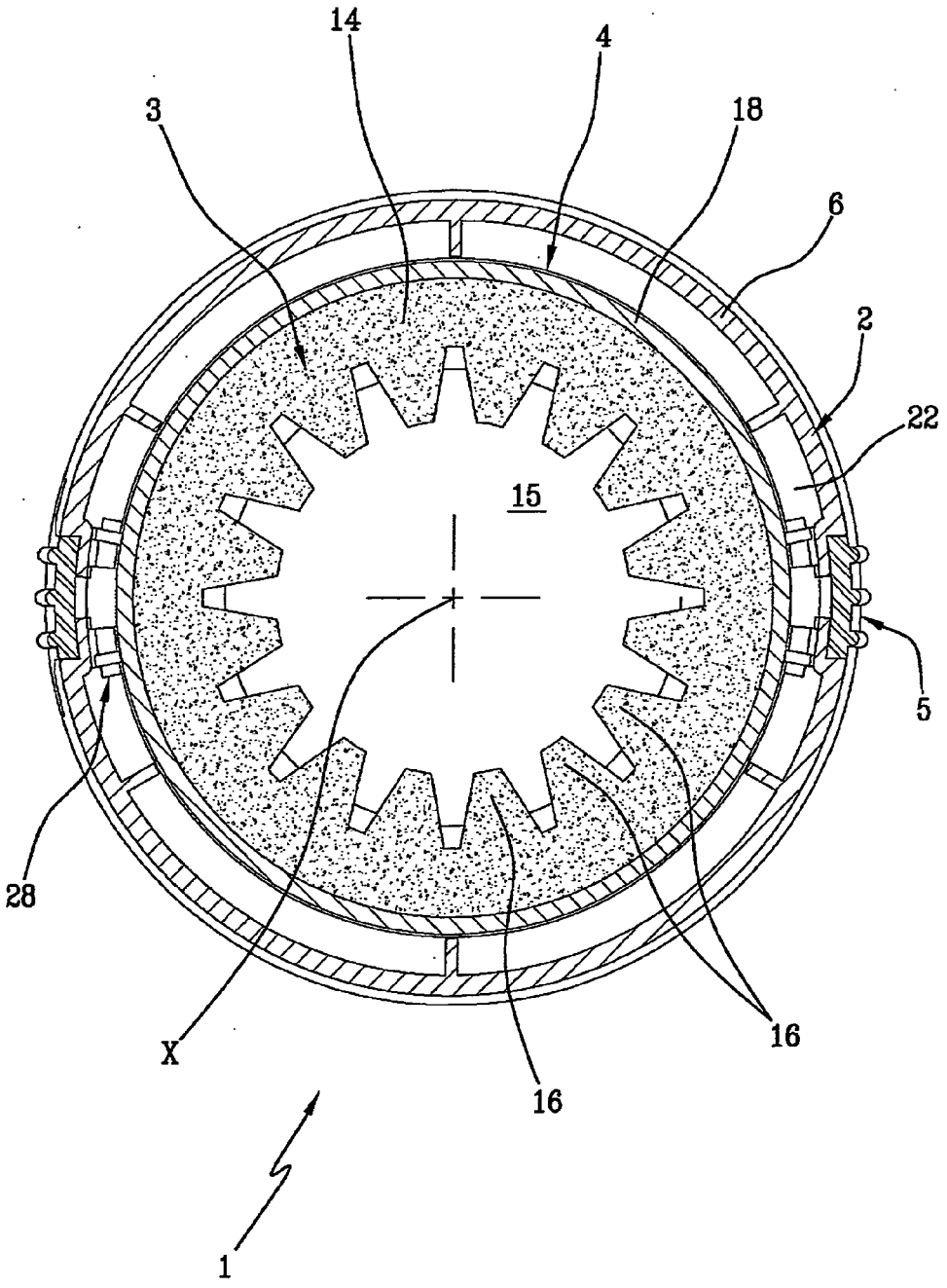


Fig.8



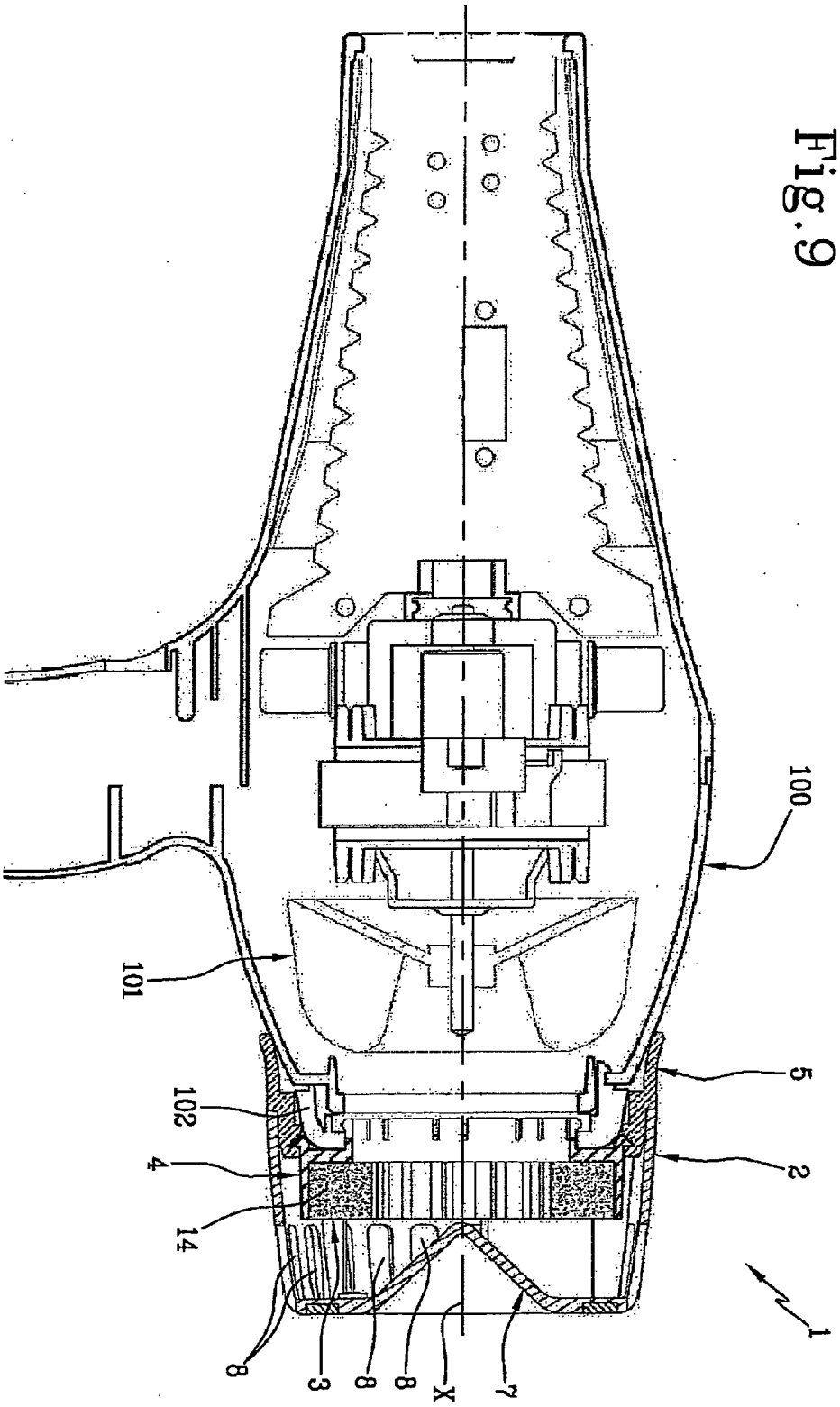


Fig.9

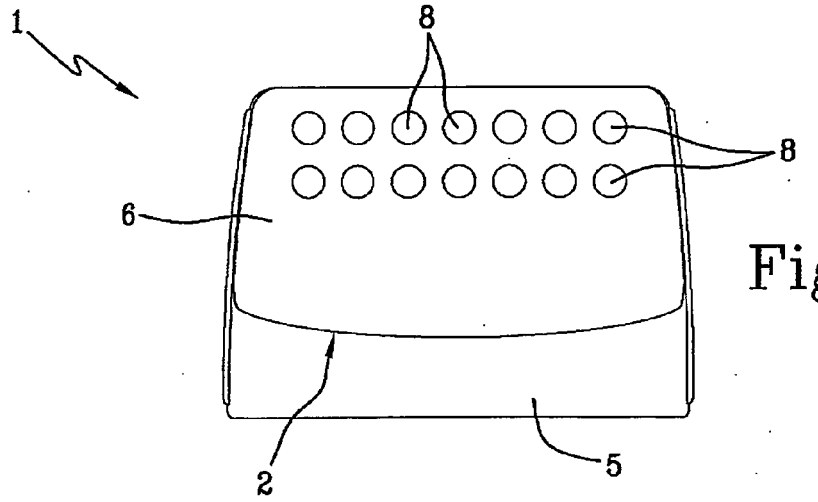


Fig.10A

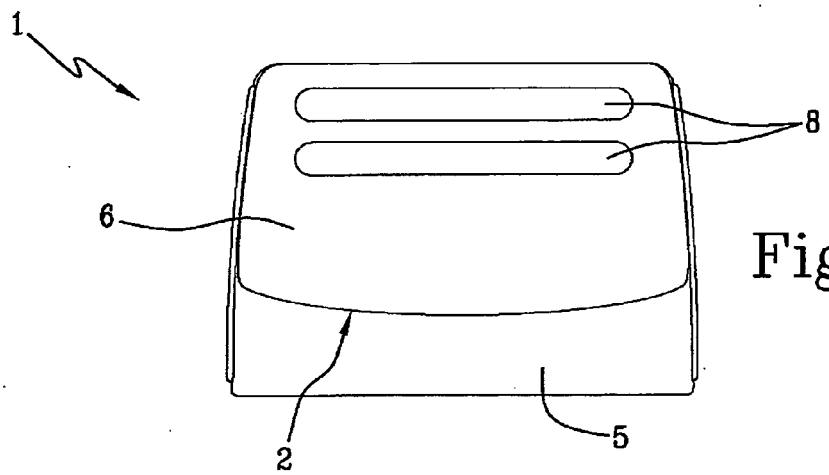


Fig.10B

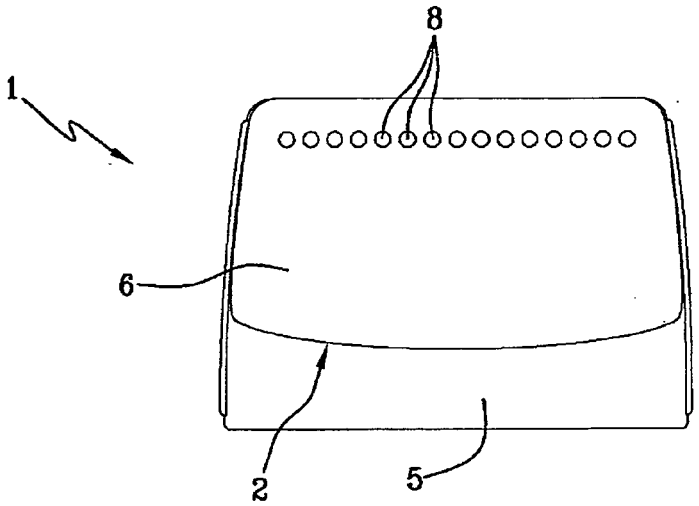


Fig.10C

Fig.11A

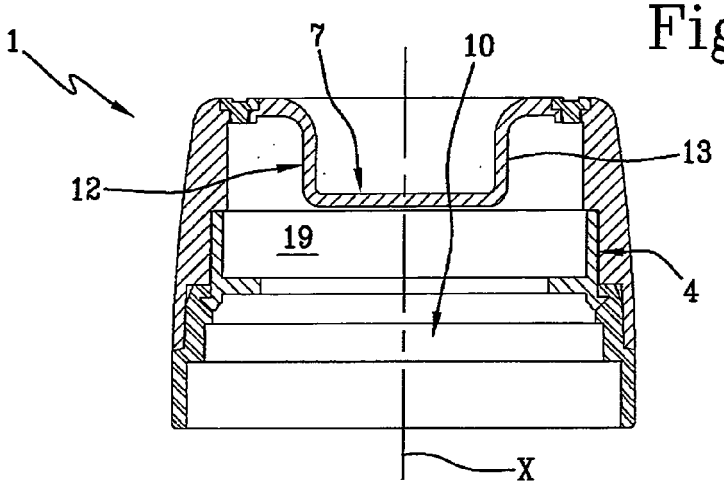


Fig.11B

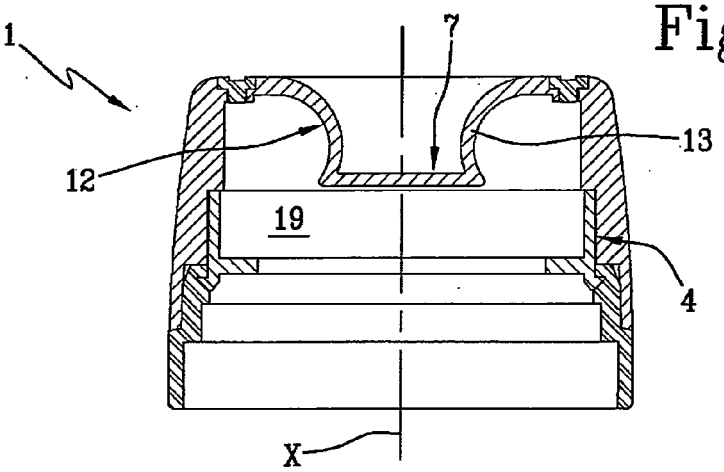


Fig.11C

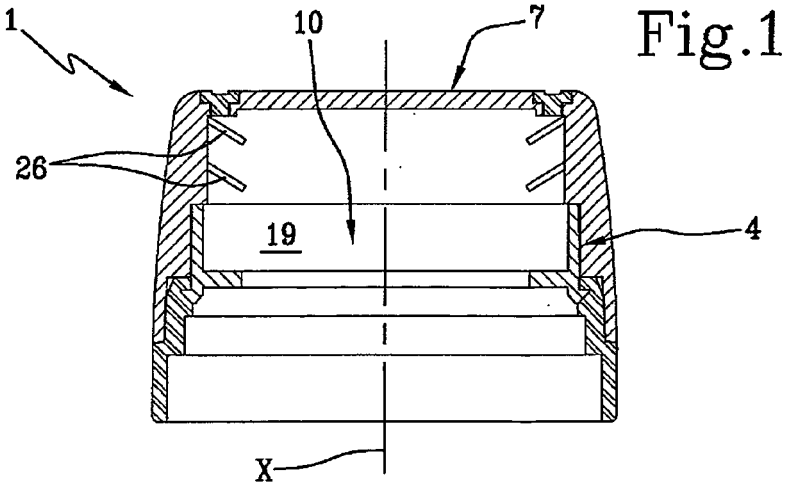
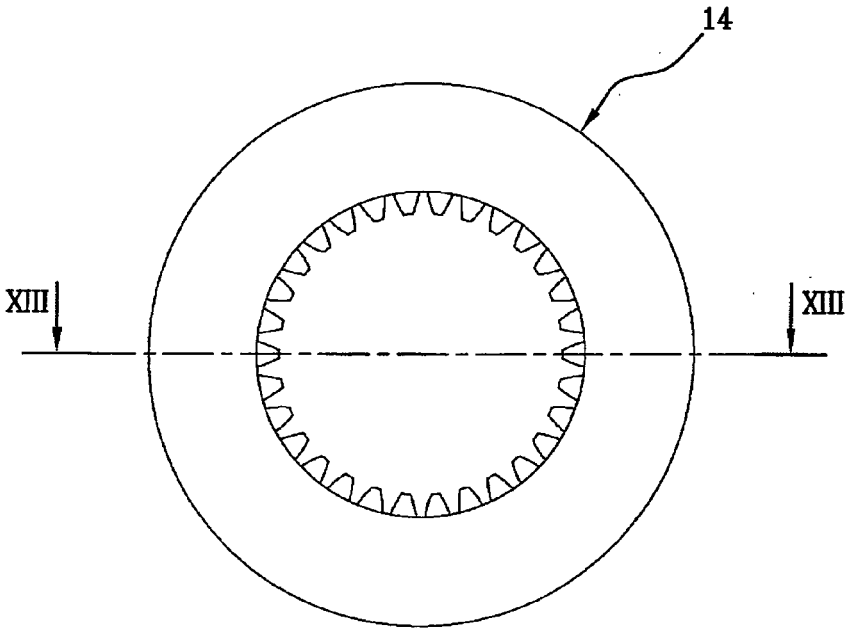


Fig.12



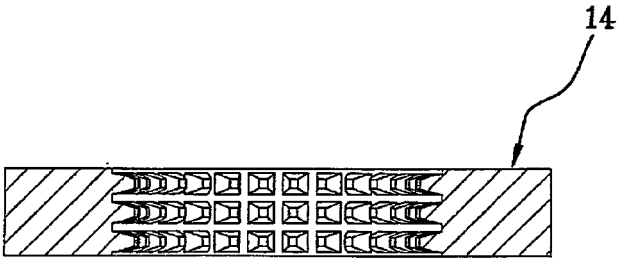
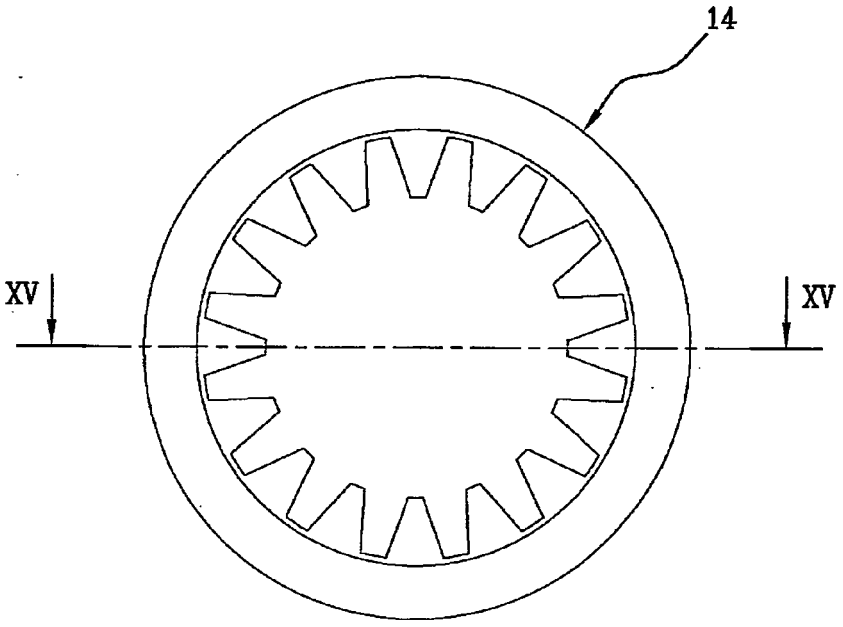


Fig.13

Fig.14



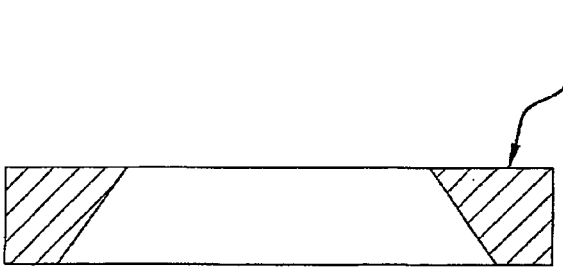


Fig.15

Fig.16

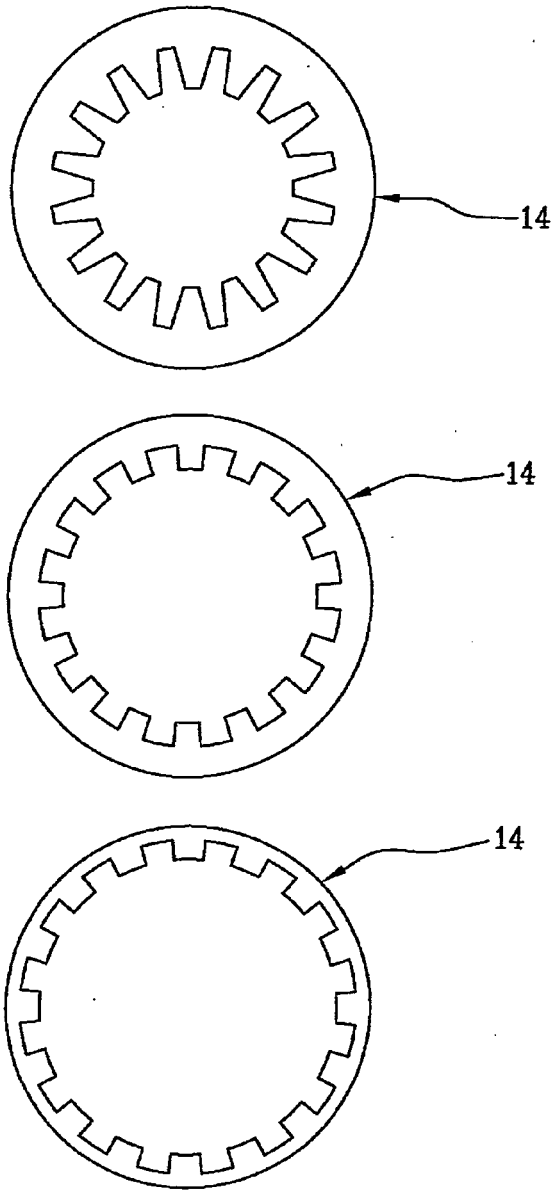
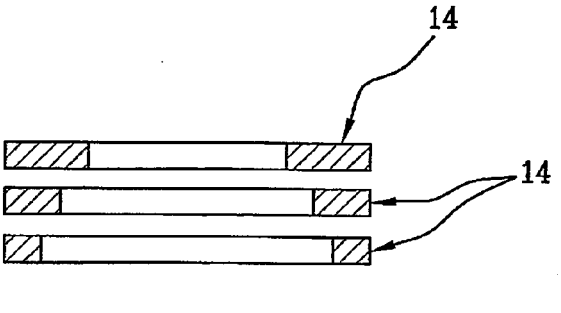


Fig.17



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EUROPEAN SEARCH REPORT

Application Number
EP 11 00 3443

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2010/045698 A1 (RODRIGUES OSCAR JOSE [BR]) 29 April 2010 (2010-04-29) * page 1, line 4 - line 15 * * page 2, line 27 - page 3, line 13 * * page 8, line 6 - line 19 * * page 12, line 25 - page 13, line 14; claims; figures *	1-11	INV. A45D20/12
X	US 4 025 223 A (ANDERS KLAUS ET AL) 24 May 1977 (1977-05-24) * column 1, line 5 - line 8 * * column 1, line 39 - line 45 * * column 2, line 35 - line 54; claims; figures *	1-11	
A	US 2009/188126 A1 (GAILLARD CHRISTOPHE [FR] ET AL) 30 July 2009 (2009-07-30) * paragraph [0041]; figures *	9-11	
A	DE 88 05 910 U1 (MERGES MARCO) 16 June 1988 (1988-06-16) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) A45D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 November 2011	Acerbis, Giorgio

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07-11-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010045698 A1	29-04-2010	EP 2346369 A1	27-07-2011
		US 2011203128 A1	25-08-2011
US 4025223 A	24-05-1977	AR 216047 A1	30-11-1979
		AU 502128 B2	12-07-1979
		AU 8681575 A	26-05-1977
		DE 2457183 A1	10-06-1976
		ES 441939 A1	16-03-1977
		FR 2293611 A1	02-07-1976
		IT 1043674 B	29-02-1980
		JP 947066 C	30-03-1979
		JP 51082403 A	20-07-1976
		JP 53028641 B	16-08-1978
		NL 7514051 A	09-06-1976
		YU 245375 A	31-05-1982
US 2009188126 A1	30-07-2009	AU 2009224545 A1	17-09-2009
		CA 2712924 A1	17-09-2009
		CN 102088884 A	08-06-2011
		EP 2237700 A2	13-10-2010
		FR 2926704 A1	31-07-2009
		WO 2009112690 A2	17-09-2009
		US 2011016737 A1	27-01-2011
DE 8805910 U1	16-06-1988	NONE	

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